Reach for the Stars

Division B Science Olympiad

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Saturday, February 11, 2012

Team Name: _____

Team Number: _____

Competitor Name: _____

Competitor Name: _____

This test is comprised of two parts:
Part I: Sky Identification
Part II: Astronomical Knowledge

There are a total of 100 questions

You have 50 minutes to complete this test

Please put all answers on the provided answer sheet, and when applicable, be as specific as possible in reference to DSO names and other astronomical terms

You are allowed up to two 8.5" x 11" pages of notes for this event

Good luck! And may the stars be with you!

Part I: Sky Identification

Use Sky Charts 1 and 2 to fill in the table on the answer sheet (Questions 1-36, 1 point each)

The symbols signify the following:

A capital letter signifies a constellation

A lower case letter signifies a star

A number signifies a deep sky object

Use full names of any stellar object when possible

For example: to identify a Messier Object, include <u>BOTH</u>

the Object's Name <u>AND</u> Messier Number in your answer

Part II: Astronomical Knowledge

Use the provided H-R Diagram at the bottom of the page to answer Questions 37-51 (1 point each)

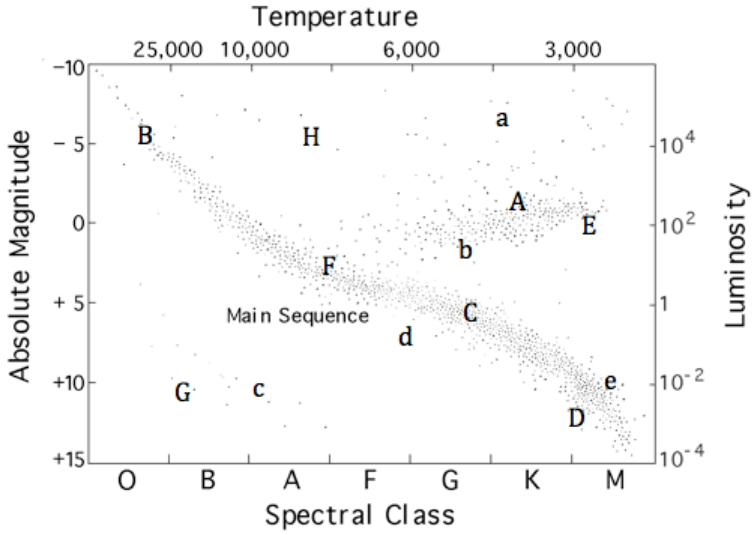
37. Which lower case letter represents the main sequence?
38. Which lower case letter represents supergiants?
39. Which lower case letter represents red dwarves?
40. Which lower case letter represents white dwarves?

41. Which capital letter is our Sun, Sol?
42. Which capital letter is Mira?
43. Which capital letter is Merope?
44. Which capital letter is Sirius B?

45. Which lower case region contains stars with the largest radii?
46. Stars will remain in which lower case region for the majority of their lives?
47. Which lower case region contains stars with the smallest mass?
48. Which lower case region contains stars that are near the end of their evolution?

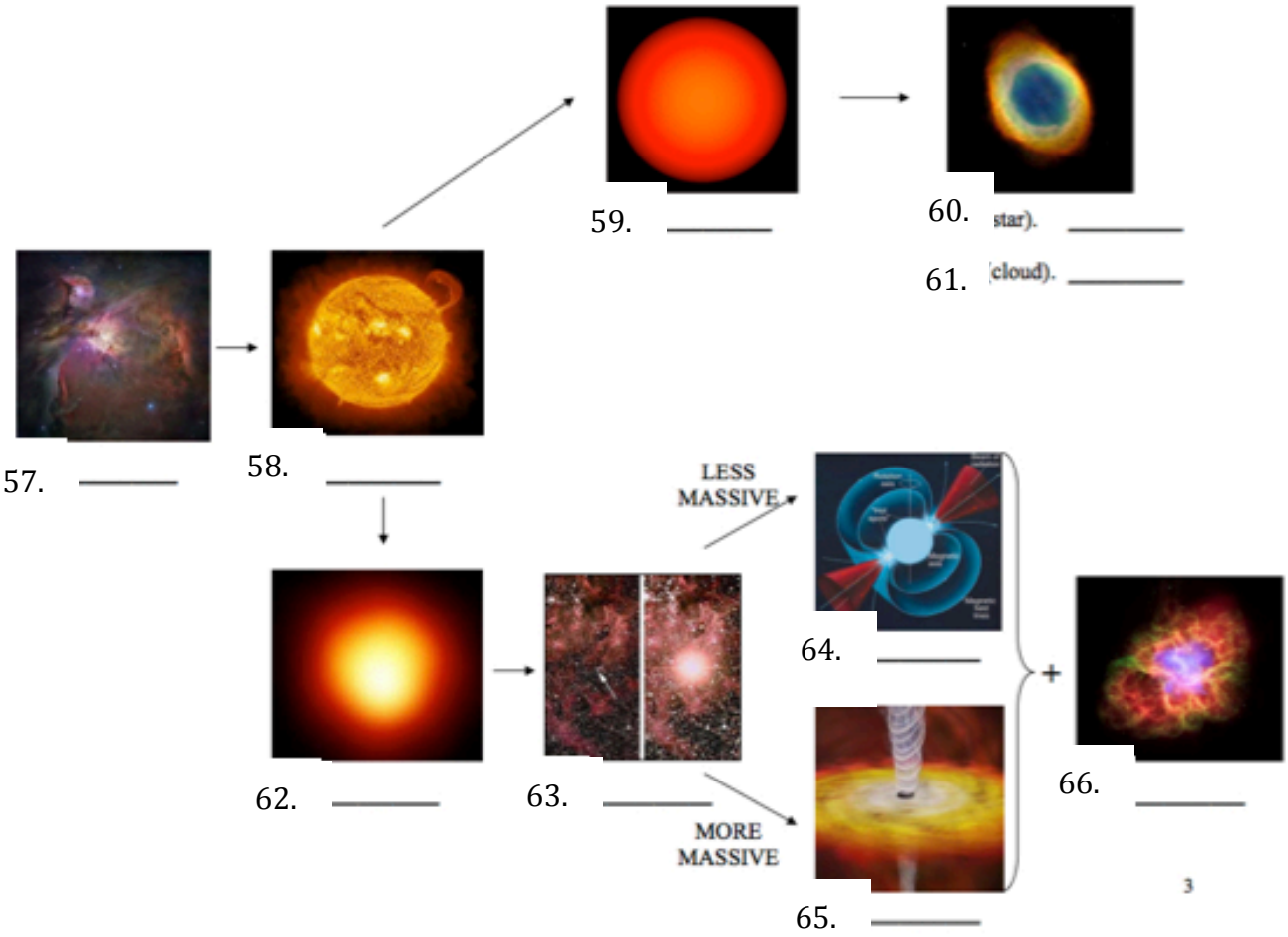
49. What is the full name of the H-R Diagram?
50. What are the units for the right-vertical axis, luminosity?
51. What are the units for the top axis, temperature?

52. What is the spectral classification of Polaris?
53. What is the spectral classification of Antares?
54. What is the spectral classification of Gliese 581?
55. What is the spectral classification of our Sun?
56. What is the spectral classification of Altair?



For Questions 57-66, fill in the blanks of the following flow chart on the answer sheet

Stellar Evolution: Fill in the stage of evolution at each spot on the chart (1 point each)



Questions 67-71 are general knowledge about stellar evolution (1 point each)

67. What is the property of a star that will define its path of evolution?
68. Through what process does a star create its energy?
69. What element is used as fuel for this process?
70. Supernovae create elements heavier than which element?
71. What is the name of a gaseous object in a stellar nursery that does not become massive enough to form a star?

Galaxies

For Questions 72-75, identify the type of each of the pictured galaxies (1 point each)

72.

73.

74.

75.

For Questions 76-78, name the following galaxies and state their type (2 pts each)

76.

77.

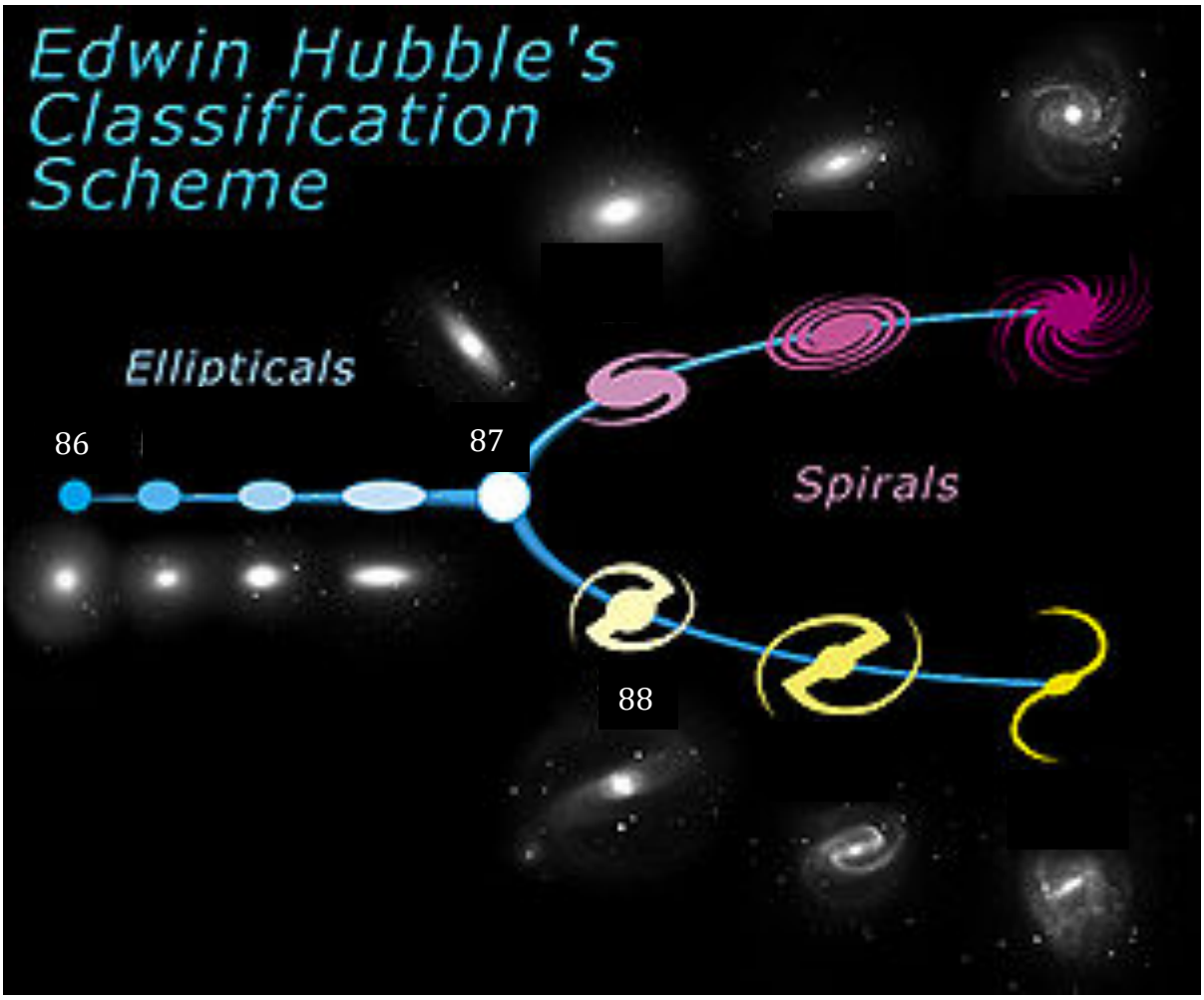
78.

Questions 79-85 are general knowledge about galaxies (1 point each)

79. What object resides at the center of our galaxy?
80. What type of object is it?
81. How is it theorized that these objects form?
82. Our galaxy is theorized to be what type of galaxy? Be specific.
83. Which class of stars has a higher metallicity, Population I or Population II?
84. Population II Stars are most commonly found in which type of galaxy?
85. Globular Clusters are found in what region of a galaxy?

For Questions 86-88, fill in the blanks of the following flow chart on the answer sheet

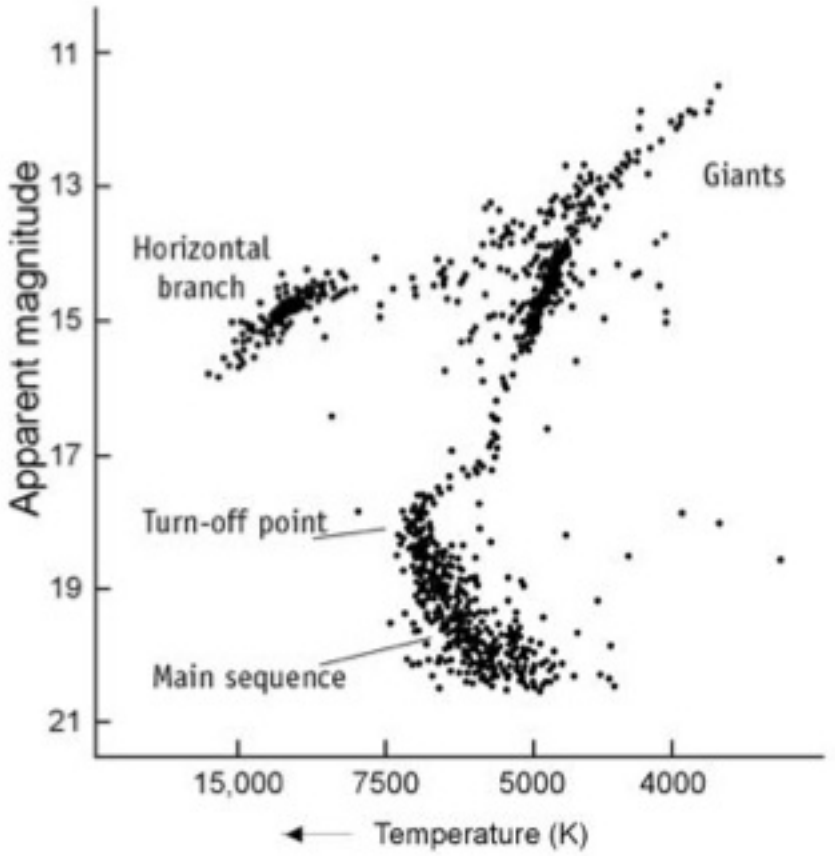
Hubble Classification: Fill in the missing Designation for each question (1 point each)



Questions 89-96 are modern topics in astronomy (1 point each)

89. A star's parallax is observed to be .01 arcseconds. What is the distance to this star in parsecs?
90. Why is the term "spectroscopic parallax" a misnomer?
91. What is a standard candle?
92. Which type of supernova is a standard candle?
93. What is the cause of that type of supernova?
94. Why can it be considered a standard candle?
95. What is, in theory, accelerating the expansion of the Universe?
96. Why has Gliese 581 been in the news so often over the past few years?

The following H-R Diagram is for the globular cluster M13. Notice how the diagram is different from the classical H-R Diagram that contains a large sampling of stars from the galactic plain.



Questions 99-100 are based on the above diagram (1 point each)

97. Consider two stars, A and B, each with equal radii and similar composition. Star A is hotter than Star B. Which star is more luminous?
98. Most stars in a globular cluster formed around the same time. Explain why hot stars (the top left corner) are "missing" from the main sequence.
99. What information can we infer about a globular cluster from the location of the turn-off point?
100. Explain why it is possible to use apparent magnitude rather than absolute magnitude as a scale for the H-R Diagram of a globular cluster.